[0006]

[Preferred Embodiment of the Invention]

Fig. 1 illustrates a computer 10 for communication between a display 12 and a keyboard 14. The mouse 16 is used to control the position of ison 18 displayed on the display 12, inputs the numerical data to the computer 10 and makes communication with the telephone network 20 via the telephone network interface 22. In this invention, the mouse 16 makes communication, using a conductor, with a computer or with the telephone network interface 22 using the infrared signal.

[0007]

Fig. 2 and Fig. 3 are respectively plan view and side view of the multi-function mouse 16. The upper surface of the multi-function mouse 16 includes a key pad 40 consisting of user operation switch, namely key 42. The key is given the number in the desired sequence but it is desirable that the key arrangement should be identical to that of the ordinary telephone set.

[0008]

The keys 44 and 46 instructs the computer 10 to convert the system to interpret the operation of switch 42. The computer 10 interprets operation of switch 42 in the two systems depending on the system used by the mouse 16. When the mouse 16 is used in the key pad mode, the switch 42 is interpreted as the key pad and activation of key given the number "1", "2" and "3", etc. is interpreted as the numerical data 1, 2 and 3, etc. When the mouse 16 is used as the point and click mode of the related art, the switch 42 is interpreted as the mouse of related art by the similar method. Namely, activation of key given the number "1", "2", "3", etc. is interpreted as the left, center and right buttons of the mouse of the related art. In the point and click mode, the other keys of keypad 40 is neglected by the computer 10. While the mouse 16 is in the mode used as the mouse of the related art, when the keys 44 and 46 are depressed simultaneously, the computer 10 changes the system for interpreting the switch 42 and the mouse 16 is changed to the key pad mode. When the keys 44 and 46 are depressed again simultaneously, the computer 10 changes the system to interpret the switch 42 and the mouse 16 is used as the point and click mode of the related art. Moreover, switching between the key pad and point and click mode of the related art may be realized with single switch, but unexpected mode conversion can be prevented by using a couple of keys.

[0009]

The switches 48 and 50 are used when a user makes communication via the telephone network 20. The switches, namely the keys 48 and 50 are used for conversion to on-hook from off-hook condition, or to off-hook from on-hook condition. When a user simultaneously depresses the keys 48 and 50, the off-hook and on-hook conditions are switched. For example, a user depresses the keys 48 and 50 to start conversation through telephone set to obtain the dial tone in the off-hook condition. When a user tries to end the telephone conversation, he is requested to simultaneously depress again the keys 48 and 50 to attain the on-hook condition. Moreover, the on-hook and off-hook conditions may be controlled with single key. When two keys are used, unexpected conversion of on-hook and off-hook conditions may be prevented. Audio signal of a user is transmitted to the telephone network using a microphone 52. The microphone 52 is

arranged on the surface of upper part of the mouse 16 but it may also be arranged at the desired position to receive the audio signal of user. In addition, it is also possible to arrange a large speaker on the surface 55 of the upper part of the mouse 16.

[0010]

The mouse 16 enables communication between the computer 10 and telephone network 20 via the wired communication link or radio communication link. In the embodiment of the radio communication, an infrared light emitting diode (LED) may be used but communication in the radio frequency may be used. In the radio communication system, LED 58 is used for communication with the infrared receiver comprised in the computer 10, while LED 60 for communication with the infrared receiver comprised in the telephone network interface 22. In order to minimize interference between communication channels, LEDs 58 and 60 have different wavelengths of infrared ray. For example, the LED 58 uses the wavelength which is well sensible to the receiver of computer 10 but is never sensible to the receiver of telephone network interface 22. Moreover, it is possible to discriminate two communication channels (namely, communication channel between the mouse and computer and communication channel between mouse and telephone network interface) by utilizing the encoding method for making communication using the similar wavelength for both computer 10 and telephone network interface 22. Since the encoding method is used, single light emitting diode may be used for communication. Moreover, using the wire or conductor, communication between the mouse 16 and computer 10 and/or between mouse 16 and telephone network interface 22 may be realized. If a wire should be used, it is preferable that wired communication is conducted between the mouse 16 and computer, and wireless communication between the mouse 16 and telephone network interface 22.

[0011]

In Fig. 3, the mouse 16 comprises a ball 64 and this ball 64 detects movement of mouse when the mouse moves at the surface. Moreover, a ball may be projected from the surface of upper part of mouse in place of the surface of lower part thereof. In this case, the ball is used as a track ball device and a user can rotate the ball to move the icon of mouse up to the desired position on the display 21. The embodiment of the track ball of the present invention is not required to move the mouse 16 for controlling the icon of mouse and therefore has a merit to save the extra space of desktop area.

[0012]

Fig. 4 is a block diagram illustrating the function of mouse 16. The position detecting circuit 90 monitors movement of ball 64 and generates a signal requested by the computer 10 to control the position of mouse icon, for example, the pointer icon on the telephone network 20. The position detecting circuit 90 rotates the roller, with the well known technique, with rotation of the ball 64 when the mouse 16 moves along the surface. Rollers are arranged with an interval of 90 degrees at the external circumference of the ball 64. One roller detects rotation by movement of mouse 16 in the X direction and another roller detects rotation by movement of mouse 16 in the Y direction. Each roller is loaded to the shaft for rotating the disk with slot and shafts are provided to assure orthogonal crossing. The disk with slot shields the optical beam between the light emitting diode and photo transistor to generate a signal to display the rotation of ball 64. The computer 10 uses these signals with the method of related art corresponding to movement of mouse 16 to monitor the movement of mouse 16 in the X and Y directions. Thereby, the icon on the display 12 can be moved. When radio communication is used between the mouse 16 and computer 10, the radio interface 92

converts the signal from the position detecting circuit 90 to the signal of radio frequency or infrared ray and this signal is received by the receiver corresponding to the computer 10. These interfaces are well known technique and it is similar, for example, to the infrared remote control interface of the related art used in the radio mouse.

[0013]

The key pad 40 and keys 44, 46 are capable of making communication with the computer 10. When the radio interface is used, communication is made via the radio interface 92. When the key is depressed, an identifier of such key is transferred to the computer 10 by the known method. As explained above, when the keys 44 and 46 are depressed simultaneously, the computer 10 changes the system for interpreting the input from the mouse 16. As illustrated in Fig. 5, it is also possible to instruct the computer 10 to interpret the input from the mouse 16 as the keypad input, in place of the existing input by the mouse, by moving the pointer icon 97 of mouse to the predetermined area 98 of the display 12 with a mouse 16. When the icon is moved to this position on the display 12, an input from the mouse 16 is interpreted as the keypad input, in place of simple click and point input. Moreover, the system can also be controlled to interpret the input from the mouse 16 as execution of software.

[0014]

Moreover, the keypad 40 is also connected to the existing telephone circuit 100. The telephone circuit 100 receives an input from the keypad 40 and microphone 52 and provides an output to 54. The telephone circuit 100 realizes connection to the telephone network 20 by the existing method to use the "chip" and "ring" lines with the technique of related art. When radio link is required between the mouse 16 and telephone network 20, the radio interface 102 is used. This radio interface 102 may be replaced with the radio frequency interface of the related art used for cordless telephone or with the infrared communication interface used in the infrared remote control system. When the radio interface is used, the adequate receiver is used as the telephone network interface 22. For example, when the radio frequency communication is introduced, the telephone network interface 22 is similar to the control device of the existing cordless telephone set and when the infrared communication is introduced, the telephone network interface 22 is similar to the existing infrared receiver. In addition, the telephone circuit 100 receives the intput from the switches 48 and 50 via the on/off hook control device 104. As is explained above, in the on-hook condition, when the switches 48 and 50 are depressed almost simultaneously, off-hook condition becomes effective. When the switches 48 and 50 are depressed almost simultaneously in the off-hook condition, the on-hook condition becomes effective. The on/off hook control device 104 indicates the off-hook or on-hook condition to the telephone circuit 100. The on/off hook control device 104 is realized using the adequately programmed microprocessor or using a simple condition machine which is switched to a couple of conditions when an input from the switches 48 and 50 is detected.

[0015]

When the mouse 16 makes communication with the computer 10 using a conductor, electrical power may be provided to the mouse 16 via the conductor. When the mouse 16 forms a radio structure, a battery 110 supplies the power to the circuit in the mouse 16. If the mouse 16 is used in combination with the radio communication, it is preferable to provide a tray to be used to charge the battery 110 while the mouse is not used.

[0016]

As illustrated in Fig. 5, it is preferable that a plurality of icons indicating the keypad 40 are displayed on the display 12. According to an embodiment of the present

invention, these icons are arranged to display the arrangement of keys forming the keypad 40. Therefore, it is enough to watch the display 12 while a user is manipulating the key of the keypad 16 on the mouse 16. Icon displays that when the corresponding key on the mouse 16 is depressed, display is changed and it is displayed for user that the computer 10 has received the corresponding key signal in order to provide the visible feedback to user and display the information received by the computer 10. Moreover, a user is not required to reciprocally change his eyes between the display 12 and mouse 16, making easier the manipulation. It is also desirable to provide a display which is matched with the number of keys forming the keypad 40, identifier and structure thereof. Thereby, a user is no longer required to reciprocally change his eyes between the display 12 and mouse 16 and is capable of detecting the positional relationship on the mouse 16. For example, these icons have the profile perfectly matched with the keys forming the keypad 40.

[0017]

Fig. 6 illustrates a single icon 120 corresponding to the mouse 16. The icon 120 can be moved by the method similar to that for the existing pointer icon. Here, a segment 122 is used as the position point of icon. If the icon 120 is not movable one, the existing pointer icon further adds the icon 120 to provide an input to the computer. In order to minimize the area of display occupied by icons, it is preferable that the icon 120 is considerably smaller than the display area. The icon 120 has several active areas and its display is changed when the corresponding key of the mouse 16 is activated. In this embodiment, the active area is offered for the keys forming the keypad 40 and keys 44, 46, 48, 50. The active areas corresponding to a part or entire part of the keys 44, 46, 48, 50 may be omitted but it is preferable to have the active areas corresponding to respective keys. Additional active area gives position and direction of key of the mouse 16 to a user, not requiring repetitive change of his eyes between the display 12 and mouse 16.

[0018]

The switch 50 or 48 may also be located in the other position such as in the computer 10. In this case, the signal between the telephone circuit 100, microphone and speaker is transmitted via the interface between the mouse 16 and computer 10. By arranging the speaker and microphone to the computer 10, size of mouse 16 can be reduced but it is more preferable to provide the speaker and microphone to the mouse 16 in order to enhance mobility of mouse 16.

[0019]

It is also possible to arrange the telephone circuit 100 in the computer 10. In this embodiment, information from the keypad 40 is transmitted to the computer 10 by the telephone circuit 100 and is then used. When the speaker, microphone and telephone circuit are arranged in the computer 10, the telephone circuit 100 makes communication in direct with the microphone and speaker. When the speaker and/or microphone are provided in the mouse 16 and the telephone circuit is provided in the computer 10, the telephone circuit 100 makes communication via the communication channel among the speaker and/or microphone, computer 10 and mouse 16. Since the communication channel connecting in direct the mouse 16 and telephone network interface 22 is no longer required by arranging the telephone circuit 100 to the computer 10, the number of communication channels to the mouse 16 may be reduced. In this embodiment, the telephone circuit 100 makes communication with the telephone network interface 22 via the communication channel between t he computer 10 and telephone network interface 22.

[0020]

[Effect of the Invention]

As explained above, according to the present invention, numerical input to computer can be realized easily and fatigue of user using the computer can also be alleviated.

[Brief Description of Drawings]

[Fig. 1]

Diagram illustrating computer, mouse and telephone network.

[Fig. 2]

Plan view of multi-function mouse.

[Fig. 3]

Side view of multi-function mouse.

[Fig. 4]

Block diagram illustrating a structure of multi- function mouse.

[Fig. 5]

Diagram illustrating display image of display.

[Fig. 6]

Diagram illustrating single icon having many active areas.

[Description of Reference Numerals]

10: Computer; 12: Display; 14: Keyboard; 16: Mouse;
18: Icon; 20: Telephone network;
22: Telephone network interface; 40: Keypad;
42: Switch; 44, 46: Key; 48, 50: Switch;
52: Microphone; 55: Upper surface; 58, 60: LED;
64: Ball; 90: Position detecting circuit;
92: Radio interface; 97: Pointer icon; 98: Area;
100: Telephone circuit; 102: Radio interface;
104: On/off hook control device; 110: Battery;
120: Icon; 122: Segment.